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A method and apparatus are disclosed for transmitting a facsimile of a page (4) having information on both of its sides (4a, 4b). The apparatus is made up of a conventional fax machine (2) equipped with two scanners (6a, 6b) for scanning the page and forming an electronic image of it. Each scanner scans one side of the page. The electronic images are sequentially gated to a communications channel (5a, 5b). The device is controlled by a suitably programmed microprocessor (16). The gating of the electronic images is accomplished by a multiplexer (14) or one or more buffers (12).

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**METHOD AND APPARATUS FOR SENDING FACSIMILES OF DOUBLE  
SIDED PAGES**

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**BACKGROUND**

This invention relates in general to the field of telecommunications and in particular to a method and apparatus for transmitting a facsimile of a page having information on both sides of it.

The increasing importance of conserving natural resources, has made it desirable to use double sided documents. Many businesses encourage their employees make double sided copies of documents in order to save money on copy paper and do their part in preserving the environment. While this is an admirable effort, the making of double sided copies of documents can cause confusion when the double sided copies are themselves copied or sent by facsimile.

Frequently the person making the copies or sending the facsimile does not realize that the pages were double sided until it is too late. While this problem is less serious in the context of photocopies, when a fax transmission is involved, great confusion can result. This is particularly true if the recipient and sender are in different time zones. The result of a fax transmission missing half its pages is increased cost in the form of long distance telephone charges needed to inform the sender of the problem and to retransmit the missing pages, not to mention the confusion and inconvenience.

Document feeders which feed documents such that double sided photocopies can be made are well known. Since they work by flipping pages so that they can be copied on both sides, they are relatively slow and expensive.

They are therefore not suitable for facsimile machines. Furthermore, if a double sided document feeder were to be used to feed documents into a fax machine, each page would still have to be scanned twice, thus adding to the slowness of the device.

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There is therefore a need for a simple electronic device to permit faxes of double sided documents to be sent without undue time delays.

### SUMMARY OF THE INVENTION

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The invention is a facsimile transmission apparatus for transmitting a facsimile of a page along a communications channel. The page has first and second sides. The apparatus has a first means for forming an electronic representation of the first side and a second means for forming an electronic representation of the second side. Means are provided for controlling the first and second means. A transmitting means is provided for first transmitting the electronic representation of the first side along the communications channel and thereafter transmitting the electronic representation of the second side along the communications channel.

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The transmitting means sequentially gates the first and second sides to the communications channel. The apparatus has a buffer for holding the electronic representation of the second side while the transmitting means transmits the electronic representation of the first side. The apparatus may also have a further buffer for holding the electronic representations of the first side.

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The invention also contemplates a method of sending along a communications channel a facsimile of a page having a first and second sides. The method has the steps of forming an electronic representation of the first side; forming an electronic representation of the second side; gating the electronic representation of the first side to the communications channel and thereafter gating the electronic representation of the second side to the communications channel. The steps of forming the electronic representations of the first and second sides are preferably performed substantially simultaneously.

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The method may also comprise the step of holding the electronic representation of the second side in a buffer during the transmission of the electronic representation of the first side. Alternatively, the step of holding the electronic representations of the first side in a buffers prior to gating the electronic representations of the first and second side to the communications channel one at a time.

### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of the preferred embodiment of the invention;

Figure 2 is a timing diagram illustrating the preferred method of the invention;

Figure 3 is a block diagram of an alternative embodiment of the invention;

Figure 4 is a timing diagram illustrating an alternative method of the invention.

### DETAILED DESCRIPTION

The following description is of a preferred embodiment of the invention. It is intended to be exemplary of the invention and not limiting. The full scope of the invention is to be determined by the claims and their equivalents.

In Figure 1, facsimile machine (fax machine) 2 is represented in block diagram form. The block representing fax machine 2 includes components of a fax machine of the prior art such as the machines described in U.S. Patent 3,947,627 (Tanaka) which is incorporated herein by reference.

Fax machine is provided with a first scanner 6a and a second scanner 6b. First scanner 6a is placed such that it can scan first (bottom) side 4a of paper 4 and second scanner 6b is placed so that it can scan second (top) side 4b of paper 4. First and second scanners 6a, 6b are laterally spaced from one another about axis A-A' so that the light emitted by one will not interfere with the other. Opaque screens 8a and 8b are provided on either side of paper 4 to prevent scanners 6a and 6b from interfering with each other.

When paper 4 is fed into fax machine 2, Central processing unit (CPU) 16 activate scanners 6a and 6b by activating control lines 5a and 5b respectively so that they scan sides 4a and 4b substantially simultaneously. Scanners 6a and 6b  
5 respectively produce outputs 10a and 10b which are electronic representations of the information of sides 4a and 4b respectively. Output 10a is fed through multiplexer (MUX) 14 which at this point in time is enabled by CPU 16 via control line 9a to allow the transmission of output 10a to communications channel 30. Output 10b is fed into buffer 12 which holds output 10b for at least as long as  
10 it takes for output 10a to be transmitted along communications channel 30. When the transmission of output 10a is complete, CPU 16 enables MUX 14 to allow output 10b to be transmitted by activating control line 9b and deactivating control line 9a.

15 It will be recognized that if side 4b is blank, its transmission will be a waste of time. In order to avoid such an occurrence, fax machine 2 may be provided with a data compaction facility to minimize the transmission time of each page. Additionally, fax machine 2 may be provided with a selector switch to disable the double sided faxing feature. The default mode of such a selector would be such  
20 that unless the machine were set to transmit single sided pages only, it would transmit double sided pages.

The following is a description of the method of the invention. Refer to the timing diagram of Fig. 2. Paper 4 is fed into fax machine 2 as shown. Paper 4  
25 typically has information printed, written or drawn on first and second sides 4a and 4b. CPU 16 activates scanners 6a and 6b substantially simultaneously by setting control lines 5a and 5b high at and for an appropriate time. Sides 4a and 4b are thus scanned substantially simultaneously or with a small time delay between starting to scan side 4a and starting to scan side 4b. Any time delay is appropriate,  
30 as long as it does not result in a delay in the transmission of second side 4b or the receipt of a new page being unduly delayed.

Outputs 10a, 10b are thus generated by scanners 6a and 6b. Outputs 10a and 10b are respectively electronic representations of sides 4a and 4b. As shown in  
35 Fig. 2, CPU 16 activates MUX 14 when scanner 6a is activated. Control line 9a from CPU 16 instructs MUX 14 to transmit the signal on line 10a. An electronic

representation of the contents of side 4a is thus gated to communications channel 30.

During the transmission of the electronic representation of side 4a, the electronic representation of side 4b is held in buffer 12. Control line 9b from CPU 16 is low at this time. When the transmission of the electronic representation of side 4a is complete, CPU 16 sets control line 9b high and control line 9a low, causing MUX 16 to allow buffer 12 to gate its contents to MUX 14. Output 10b is thus gated to communications channel 30. When the transmission of the electronic representation of side 4b is complete, the process can be repeated for a new page.

In an alternative embodiment, shown in Fig. 3, MUX 14 is replaced by buffer 112a and buffer 12 is replaced with buffer 112b. CPU 116 activates scanners 106a and 106b by means of control lines 105a and 105b respectively. During the time that scanner 106a is scanning, control lines 114a to buffer 112a and control line 114b to buffer 112b are respectively set high to allow outputs 110a and 110b to be accepted respectively by buffers 112a and 112b. Substantially simultaneously with the scanning by scanner 106a or after a time delay, control line 118a instructs buffer 112a to gate its contents to communications channel 130 and control line 118b is set low to prevent buffer 112b from gating its contents to communications channel 130. When the contents of buffer 112a have been transmitted, CPU 116 sets control line 118a low and instructs buffer 112b to gate its contents to communications channel 130 by setting control line 118b. Buffers 112a and 112b may have the capacity to store several pages. This allows a stack of double sided sheets to be scanned, stored and transmitted one at a time in the correct sequence. CPU is programmed to accomplish this.



**I CLAIM:**

1. A facsimile transmission apparatus for transmitting a facsimile of a page along a communications channel, the page having first and second sides, the apparatus comprising:
- 5
- first means for forming an electronic representation of the first side;
- second means for forming an electronic representation of the second side;
- 10
- means for controlling the first and second means;
- gating means for first transmitting the electronic representation of the first side along the communications channel and thereafter transmitting the electronic representation of the second side along the communications channel.
- 15
2. The apparatus of claim 1 wherein the gating means comprises means for sequentially gating the first and second sides to the communications channel.
- 20
3. The apparatus of claim 1 wherein the gating means comprise a multiplexer.
4. The apparatus of claim 1 further comprising a buffer for holding the electronic representation of the second side while the transmitting means transmits the electronic representation of the first side.
- 25
5. The apparatus of claim 1 further comprising first and second buffers for holding respectively the electronic representations of the first and second sides.
- 30
6. The apparatus of claim 5 wherein the first and second buffers are capable of holding electronic representations of several pages.

7. A facsimile transmission apparatus for transmitting a facsimile of a page along a communications channel, the page having first and second sides, the apparatus comprising:

- 5 first means for forming an electronic representation of the first side;
- second means for forming an electronic representation of the second side;
- means for controlling the first and second means;
- 10 gating means for first transmitting the electronic representation of the first side along the communications channel and thereafter transmitting the electronic representation of the second side along the communications channel, the gating means comprising means for sequentially gating the first and second sides to the
- 15 communications channel.

8. The apparatus of claim 7 further comprising a buffer for holding the electronic representation of the second side while the transmitting means transmits the electronic representation of the first side.

20

9. The apparatus of claim 7 further comprising first and second buffers for holding respectively the electronic representations of the first and second sides.

10. The apparatus of claim 9 wherein the first and second buffers are

25 capable of holding electronic representations of several pages.

11. A method of sending along a communications channel a facsimile of a page having a first and second sides, the method comprising the steps of:

- 30 forming an electronic representation of the first side;
- forming an electronic representation of the second side;
- gating the electronic representation of the first side to the communications
- 35 channel and thereafter gating the electronic representation of the second side to the communications channel.

12. The method of claim 11 wherein the steps of forming electronic representations of the first and second sides are performed substantially simultaneously.

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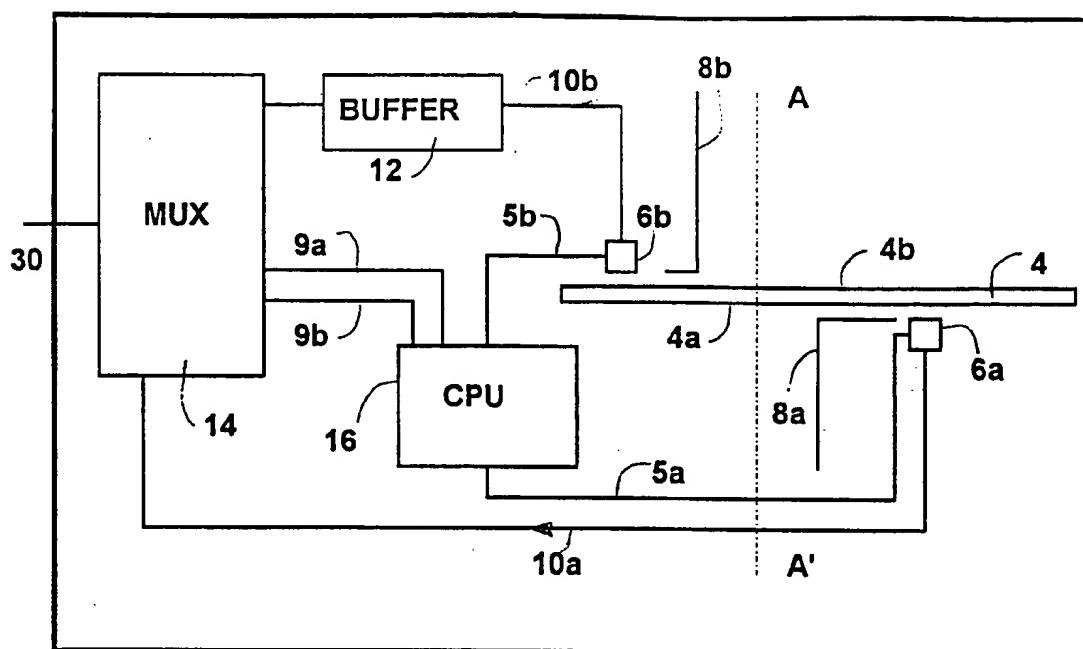
13. The method of claim 11 wherein there is a time delay between the steps of forming an electronic representation of the first side and forming an electronic representation of the second side.

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14. The method of claim 11 further comprising the step of holding the electronic representation of the second side in a buffer during the transmission of the electronic representation of the first side.

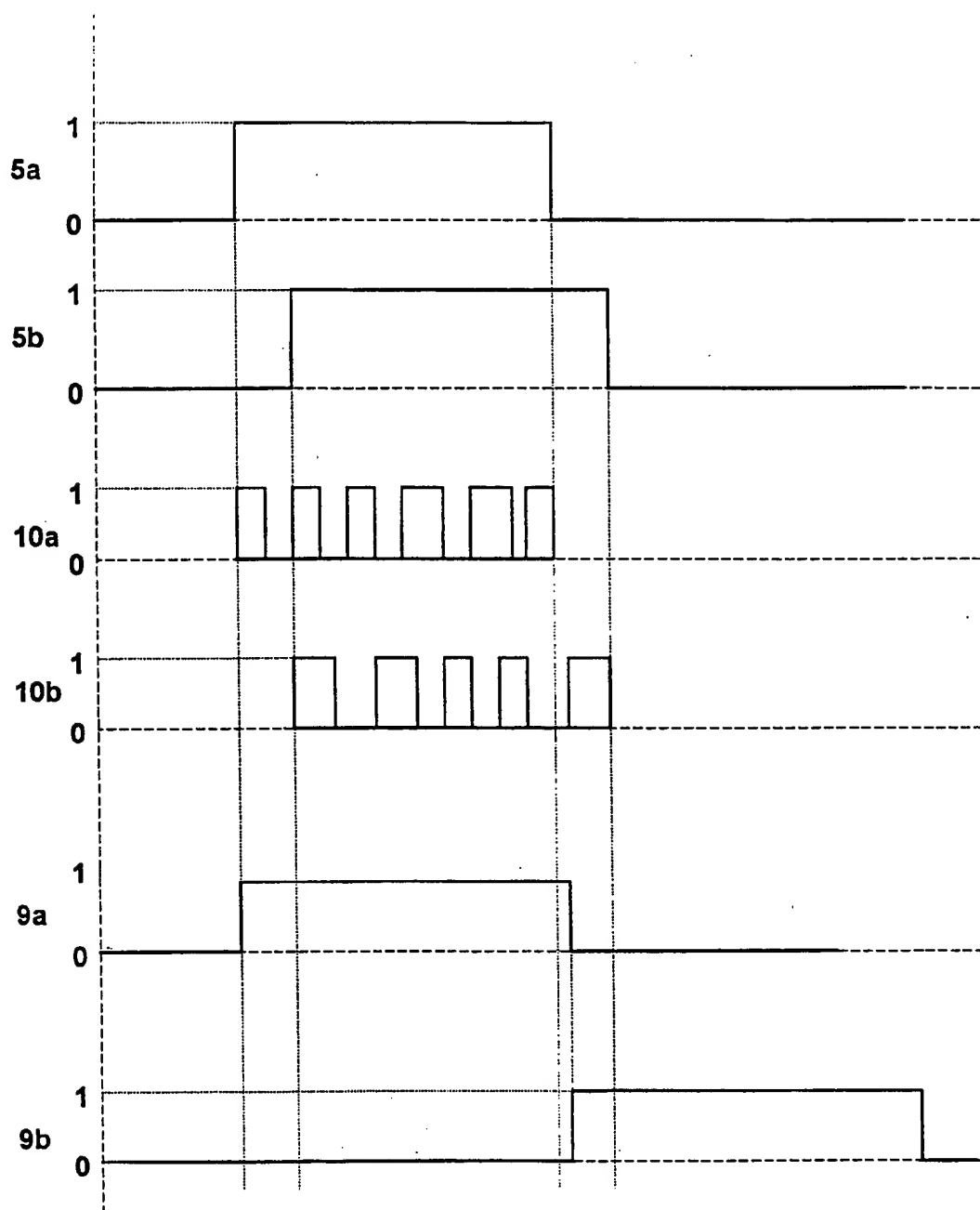
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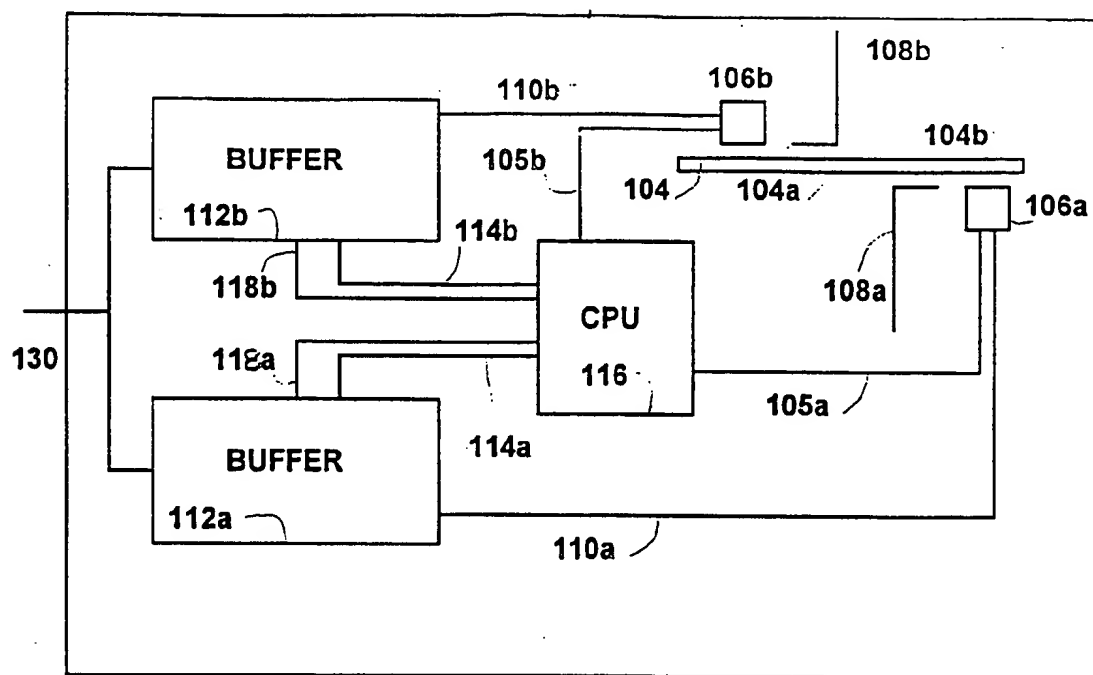
15. The method of claim 11 further comprising the step of holding the electronic representations of the first and second sides in buffers prior to gating the electronic representations to the communications channel one at a time.

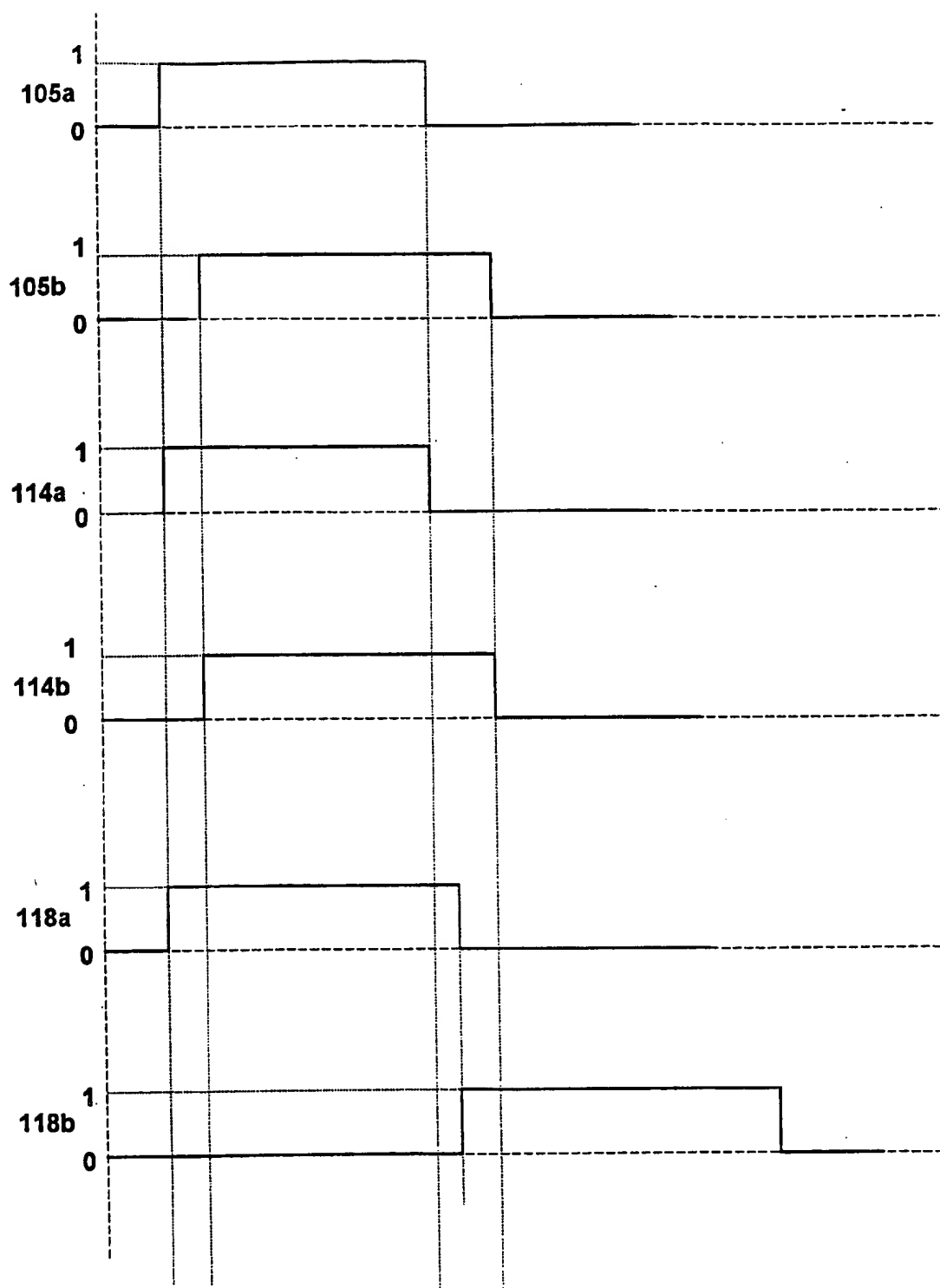


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*FIG. 1*

**FIG. 2**

*FIG. 3*

**FIG. 4**

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/06204

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :HO4N 1/00

US CL :358/400

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 358/400,401,402,406,409,410,412,413,425,434,435,486;355/23,24,320

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

SEARCH TERMS:FAX,DUPLEX MULTIPLEXER,GATE,TRANSMIT TWO SIDE ORIGINAL OR DOCUMENT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,365,886 (MURAKAMI ET AL) 28 DECEMBER 1982, ENTIRETY	1,2,12,13
X	US, A, 4,908,719 (NONOYAMA) 13 MARCH 1990, Cols. 3-7, Figs. 2,11,12	4-6,8-10,12-15 1-3,7,11
Y	US, A, 4,949,189 (OHMORI) 14 AUGUST 1990, Col. 2, line 63-Col. 5, line 66, Figs. 1,3	
Y	US, A, 5,157,521 (CHUNG) 20 OCTOBER 1992, SUMMARY	1-15

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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